

Amendment, Response and RCE under 37 CFR § 1.114

Serial Number: 10/724,432

Filing Date: November 28, 2003

Title: APPARATUS AND METHOD FOR A HIGH-EFFICIENCY SELF-CLEANING CENTRIFUGE

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IN THE CLAIMS

1. (Currently amended) A self-cleaning centrifuge for clarifying contaminated liquids comprising:

a rotor assembly supported for rotation about an axis, the rotor assembly having a first set and a second set of nested cylinders, each set having a plurality of concentric cylinders, wherein the first set and the second set are both supported for rotation and supported for rotation relative to each other, each cylinder having one or more openings at a first end of the nested cylinders and one or more openings at an opposite second end of the nested cylinders, the cylinders defining a plurality of concentric liquid passageways configured for parallel unidirectional flow of the liquids from the openings at the first end of the nested cylinders through the plurality of concentric liquid passageways to the openings at the second end of the nested cylinders.

2-12. (Canceled)

13. (Currently amended) The centrifuge of claim 1, wherein the first end and second end of the sets of nested cylinders are spaced from respective first and second end walls of the rotor assembly such that the plurality of concentric liquid passages extend from between the plurality of concentric cylinders in a radial manner and in an axial manner at a top and bottom of each cylinder.

14. (Currently amended) ~~The centrifuge of claim 1, further comprising~~ A self-cleaning centrifuge for clarifying contaminated liquids comprising:

a rotor assembly supported for rotation about an axis, the rotor assembly having a first set and a second set of nested cylinders each having a plurality of concentric cylinders, each cylinder having one or more openings at a first end and one or more openings at an opposite second end, the cylinders defining a plurality of concentric liquid passageways configured for parallel unidirectional flow of the liquids through the plurality of concentric liquid passageways; and

a brake operatively coupled to the first set of concentric cylinders to selectively brake the rotation of the first set relative to the second set.

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15. (Previously presented) The centrifuge of claim 14, further comprising a bowl body operatively coupled to the rotor assembly and connected to one of the sets of cylinders, the bowl body having one or more bottom-positioned openings adapted to facilitate a passage of accumulated waste matter when the brake is applied.

16. (Previously presented) The centrifuge of claim 15, further comprising:
a sludge receptacle operatively coupled to receive purged waste from the self-cleaning centrifuge upon application of the brake; and
a clarified-liquid collection system operatively coupled to receive clarified liquid from an upper end of the bowl body during operation of the self-cleaning centrifuge.

17. (Previously presented) The centrifuge of claim 15, further comprising:
a nozzle operatively coupled to supply the contaminated liquid to the plurality of concentric passages;
a motor operatively coupled to rotate the plurality of concentric cylinders about the axis;
and
a housing operatively coupled to hold the rotor assembly and the bowl body.

18. (Currently amended) The centrifuge of claim 1, wherein one of the sets is rotatably supported by the other of the sets, and wherein the cylinders have waste-matter collection surfaces, in order that the plurality of cylinders provide a high-efficiency self-cleaning centrifuge.

19. (Previously presented) The centrifuge of claim 1, further comprising:
a brake operatively coupled to the first set of concentric cylinders to selectively brake the rotation of the first set relative to the second set;
a bowl body operatively coupled to the rotor assembly and connected to one of the sets of cylinders, the bowl body having one or more bottom-positioned openings adapted to facilitate a passage of accumulated waste matter when the brake is applied;

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a tube operatively coupled to supply the contaminated liquid to one end of the plurality of concentric liquid passages;

a sludge collection system operatively coupled to receive purged waste from the self-cleaning centrifuge upon application of the brake;

a clarified-liquid collection system operatively coupled to receive clarified liquid from an upper end of the bowl body during operation of the self-cleaning centrifuge;

a motor operatively coupled to rotate the plurality of concentric cylinders about the axis;
and

a frame operatively coupled to support the rotor assembly and the bowl body.

20. (Previously presented) The centrifuge of claim 1, further comprising a machine tool that uses a liquid to remove debris, the liquid and debris providing at least a portion of the contaminated liquids.

21. (Currently amended) A method comprising:

providing a centrifuge for clarifying contaminated liquids, the centrifuge including a rotor assembly supported for rotation about an axis, the rotor assembly having at least a first set and a second set of nested cylinders, each set having a plurality of concentric cylinders, wherein the first set and the second set are both supported for rotation and supported for rotation relative to each other, each cylinder having one or more openings at a first end of the nested cylinders and one or more openings at an opposite second end of the nested cylinders, the cylinders defining a plurality of concentric liquid passageways;

supplying, at the first end of the nested cylinders, a liquid having components to be separated; and

rotationally centrifuging the liquid using a unidirectional parallel concentric flow from the openings at the first end of the nested cylinders, through the plurality of nested concentric cylindrical passageways, to the openings at the second end of the nested cylinders.

22. (Currently amended) The method of claim 21, wherein the passing of the liquid includes introducing contaminated liquid in a radial manner at [[a]] the first end of the nested concentric

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passageways and removing clarified liquid at ~~an opposing~~ the second end of the nested concentric passageways.

23. (Currently amended) The method of claim 21, further comprising selectively braking ~~[[a]] the first set of concentric cylinders that define boundaries between the plurality of nested concentric cylindrical passageways~~ in order to purge ~~from~~ accumulated waste from at least one or more of the surfaces of the first set of nested concentric cylinders.

24. (Previously presented) The method of claim 23, further comprising:
providing a bowl body surrounding the first set of nested concentric cylinders, the bowl body having an opening on the bottom of the bowl body; and
passing the purged accumulated waste through the opening on the bottom of the bowl.

25. (Previously presented) The method of claim 21, wherein the passing of the liquid includes:
supplying contaminated liquid at a lower end of the plurality of nested concentric cylindrical passageways; and
removing clarified liquid from an upper end of the plurality of nested concentric cylindrical passageways.

26. (Currently amended) An apparatus comprising:
~~a frame;~~
means for rotationally centrifuging liquid about an axis in a unidirectional parallel concentric flow in an upward direction through a plurality of substantially vertical nested concentric cylindrical passageways from openings at a bottom end of the nested cylinders to openings at an opposite top end of the nested cylinders, wherein a first cylinder set and a second cylinder set are both supported for rotation and supported for rotation relative to each other, the ~~means for rotationally centrifuging liquid supported by the frame.~~

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27. (Currently amended) The apparatus of claim 26, wherein the means for rotationally centrifuging liquid include a first set and a second set of nested cylinders, each set having one or more concentric cylinders, each cylinder having means for removing accumulated waste sludge at ~~a first~~ the bottom end and means for removing clarified fluid at ~~a second~~ the top end, the cylinders defining the plurality of nested concentric cylindrical passageways configured for parallel unidirectional flow of the liquid.

28. (Currently amended) The apparatus of claim 26, wherein the means for removing accumulated waste sludge further include:

- one or more openings at the ~~first~~ bottom end of each cylinder; and
- means for selectively braking the first set of concentric cylinders to loosen the sludge from the cylinders in order to have the sludge fall through the one or more openings at the ~~first~~ bottom end of each cylinder.

29. (Previously presented) The apparatus of claim 27, further comprising means for rotating the first set and the second set of nested concentric cylinders about the axis; and means for rotatably connecting the plurality of concentric cylinders to the axis.

30. (Previously presented) The apparatus of claim 27, further comprising:

- means for containing the liquid around the sets of concentric cylinders during the rotationally centrifuging liquid about the axis, and wherein the means for removing accumulated waste sludge further includes means for emptying the means for containing the liquid.

31. (Previously presented) The apparatus of claim 26, further comprising:

- means for supplying contaminated liquid into the means for centrifuging;
- means for controlling the supplying of contaminated liquid to the rotor assembly;
- means for collecting accumulated waste matter; and
- means for collecting clarified liquid.

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32. (New) The apparatus of claim 26, wherein the means for rotationally centrifuging liquid include a first set and a second set of nested cylinders, each set having one or more concentric cylinders such that every other cylinder is from one set, each set having means for removing accumulated waste sludge at its bottom end, the sets of cylinders defining the plurality of nested concentric cylindrical passageways configured for parallel unidirectional flow of the liquid.

33. (New) The centrifuge of claim 1, wherein every other cylinder is from one set of the nested cylinders.